CLAIMS

1. A method for controlling a light emitting device during and without disrupting data transmission, comprising:

modulating a light emitting device with a noise-level test signal embedded in a data signal to produce a modulated signal output;

acquiring the modulated signal from the light emitting device;

extracting the noise-level test signal from the acquired signal;

digitally processing the extracted noise-level test signal to calculate power control adjustments; and

controlling output power of the light emitting device by applying the calculated power control adjustments to the light emitting device.

2. A method for controlling a laser during and without disrupting data transmission, comprising:

generating a noise-level test signal having a predetermined characteristic;

generating a data signal having a predetermined characteristic;

modulating a laser with the generated noise-level test signal and the data signal to produce a modulated output signal;

acquiring the modulated output signal;

extracting a noise-level test signal from the acquired modulated output signal;

determining an average value of the extracted noise-level test signal;

determining a characteristic of the extracted noise-level test signal;

calculating a bias current adjustment from the characteristic of the extracted noise-level test signal;

calculating a modulation current adjustment from a ratio of the characteristic of the generated noise-level test signal to the characteristic slope of the extracted noise-level test signal;

controlling a laser bias current by applying the calculated bias current adjustment to a laser driver; and

controlling a laser modulation current by applying the calculated modulation current adjustment to the laser driver.

3. The method of claim 2 wherein the noise-level test signal is a sinusoidal signal.

4. The method of claim 2 wherein the noise-level test signal is a saw tooth signal.

5. The method of claim 2 where the noise-level test signal is a composite signal.

6. The method of claim 2 wherein the noise-level test signal is extracted by applying a digital signal processing lock-in detector algorithm and filtering to the acquired modulated output signal.

7. The method of claim 2 wherein the noise-level test signal is extracted by a applying a digital signal processing quadrature detector algorithm and filtering to the acquired modulated output signal.

8. The method of claim 2 wherein the noise-level test signal is extracted by a applying a digital signal processing regression detector algorithm and filtering to the acquired modulated output signal.

9. An apparatus for controlling a laser during and without disrupting data transmission, comprising:

a laser driver for modulating the laser with a noise-level test signal embedded in a data signal to produce a modulated output signal from the laser;

a monitor photodiode for acquiring the modulated signal from the laser;

a digital signal processor for extracting a noise-level test signal from the acquired signal and digitally processing the extracted noise-level test signal to calculate power control adjustments; and

a servo for controlling output power of the laser by applying the calculated power control adjustments to the laser driver.

10. A method for controlling output power of a laser during and without disrupting data transmission, comprising:

embedding an original test signal in system noise;

modulating the original test signal and system noise;

mathematically extracting the embedded test signal from the modulated system noise;

applying digital signal processing algorithms to the extracted test signal to calculate power control adjustments from differences between the original test signal and the extracted test signal; and

applying the calculated power control adjustments to the laser.

11. An apparatus for controlling a laser during and without disrupting data transmission, comprising:

a laser driver for modulating the laser with data to produce a modulated output signal;

a high frequency monitor photodiode for acquiring the modulated output signal from the laser and following amplitudes of the modulated output signal;

a digital signal processor for performing peak and valley detection of the followed amplitudes of the acquired output signal, and for calculating power control adjustments from the peak and valley detection; and

a servo for controlling output power of the laser by applying the calculated power control adjustments to the laser driver.

12. An method for controlling a laser system during and without disrupting data transmission, comprising:

embedding a noise-level test signal in system noise of a data signal in a first laser transceiver;

transmitting a data signal containing the noise-level test signal embedded in system noise from the first laser transceiver to a second laser transceiver using optical path;

receiving the transmitted signal at the second laser transceiver.

detecting, recovering and digitally processing the noise-level test signal at the second transceiver to determine characteristic information about the first laser transceiver and the optical path;

sending the characteristic information from the second laser transceiver to the first laser transceiver;

receiving the characteristic information at the first transceiver; and

adjusting the output characteristics of the first laser transceiver according to the received characteristic information.

13. A method for extracting a noise-level test signal from a modulated data signal during and without disrupting data transmission, comprising:

modulating a data signal containing an original noise-level test signal to produce a modulated output signal;

acquiring the modulated output signal;

multiplying the acquired modulated output signal by a copy of the original noise-level test signal to shift the frequency of an acquired noise-level test signal within the acquired modulated signal; and

filtering the frequency shifted noise-level test signal from the acquired modulated signal.

14. A method for extracting a noise-level test signal from a modulated data signal during and without disrupting data transmission, comprising:

modulating a data signal containing an original sinusoidal noise-level test signal to produce a modulated output signal;

acquiring the modulated output signal;

splitting the acquired modulated signal into a first half and a second half;

multiplying the first half of the acquired modulated output signal by a sinusoidal copy of the original sinusoidal noise-level test signal to shift the frequency of an acquired noise-level test signal within the acquired modulated signal;

filtering the frequency shifted sinusoidal noise-level test signal from the acquired modulated signal;

squaring the filtered sinusoidal noise-level test signal;

multiplying the second half of the acquired modulated output signal by a cosinusoidal copy of the original sinusoidal noise-level test signal to produce a cosinusoidal noise-level test signal and shift the frequency of the acquired cosinusoidal noise-level test signal within the acquired modulated signal;

filtering the frequency shifted cosinusoidal noise-level test signal from the acquired modulated signal;

squaring the filtered cosinusoidal noise-level test signal; and

adding the squared sinusoidal and cosinusoidal acquired test signals to produce an amplitude of the acquired noise-level test signal.